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PROGRESS REPORT OF MARTEN BREEDING EXPERIMENTS

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Preliminary breeding experiments with martens were carried on in Pritchard, Idaho, by the Biological Survey, of the Department of Agriculture in 1913. The Bureau's farm there was abandoned and the work was discontinued in the fall of 1915, however, and the martens were shipped to Washington, D. C., where for a short time they were kept in the National Zoological Park. As a result of this preliminary work done at Pritchard, Idaho, and at Washington, D. C., it was decided to establish an experimental fur farm in the foothills of the Adirondack Mountains near Keeseville, N.Y. Operations were begun there about May, 1916, and six martens were shipped to the farm from Washington, D. C., in August, 1916. At the end of January, 1917, four more were obtained, making a total of ten breeding animals under observation.

The male and female martens were not allowed to run together except during January and February, which had been generally considered the breeding period. No young were produced during 1917, and six martens were lost between the breeding season of 1917 and that of 1918. Three died of disease, two from injuries, and one escaped. The breeding stock of martens for the year 1918 was thus reduced to four. No martens were born during 1918, 1919, and 1920.

During the fall of 1919 and the spring of 1920 considerable difficulty was experienced in keeping the male martens separated from the females, because the animals frequently burrowed under the carpet wire in the pens and mingled with each other. It was observed that no matter what time of the year they were together, the martens seemed to live harmoniously. These findings were not in agreement with those of A. H. Cocks,\* a naturalist who had conducted experiments with pine martens in England. Mr. Cocks and many other naturalists reported that martens do not live happily together and will destroy one another at the slightest provocation if they are put together when the female is not in heat.

A general belief has prevailed that male and female martens can not be permitted to live together except during the months of January and February. Since the contrary has been proved true on the Government fur experiment station, it was decided to allow the males and females to live together there during all seasons of the year, except during the spring months, when the young are usually whelped. They were reasonably tame, well fed, and in healthy con-

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\* Cocks, A. H. Proc. Zool. Sec. London, 1900, p. 836.

dition, and therefore it was natural to believe they would breed and produce young. Some consideration of this problem led to the belief that perhaps martens in captivity bred at a shorter period than January or February. If this were true then the reason for no young being born would be that the males and females were not together during the ordinary mating season.

On May 10, 1920, the males were turned in with the females. They lived together in a friendly manner and nothing of importance was observed until the latter part of July and early part of August, when they squealed considerably and one of the females was seen to have received a severe injury to the ear. It was suspected that the martens were fighting, and separating the sexes was considered. Early in the morning of August 13, 1920, the martens were making so much noise that the caretaker made a special visit to the pens. On arrival he saw one pair mate and observations later in the day revealed this as the cause of the peculiar squealing.

The male marten that was seen to copulate had a small tumor on its sheath, which was thought might interfere with service. Another male therefore was used and was seen to copulate on several occasions. The next day this male was removed and the first one returned. When he entered the pen he at first failed to notice the female on the ceiling wire, but when he finally discovered her, he sprang up the side of the pen to the top and grabbed her by the nape of the neck with his teeth, carried her to the floor of the pen, and served her. This female was seen to copulate on various occasions from August 13 to 16, inclusive. Her manifestations of oestrus were characterized by her assuming a peculiar squatting position and making a sort of clucking noise, which seemed to attract the male.

On August 26, 1920, the male martens were put in pens separate from the females and kept separate until the latter part of November. They were then permitted to be with the females, until April 4, 1921, when they were again separated.

The female marten that was bred during August, 1920, gained considerable weight from one to two months after copulation and gave birth to a litter of three young on April 15, 1921. When the nest box was examined one of the young appeared to be dead. No attempt was made to remove it, because the female was extremely nervous and excited, and for this reason the nest was left undisturbed for a few days. The next time the box was opened and examined two male martens were found, but there was no trace of the third litter mate, and the supposition was that it had been eaten by the mother. As the female marten was very nervous during the early life of her litter and was prone to snap the young in her mouth by the back of their necks and drag them roughly about the pen whenever she was disturbed, it was deemed inadvisable to disturb the family at such an early stage in life.

The young are born naked (without down or fur). A few days after birth the fur begins to grow and develops steadily in length and thickness. At four or five weeks of age young martens have a fairly heavy coat of dark maltese fur. One of the young martens started to open one eye on the 31st day, but this animal died the day after its eyes opened. The remaining member of the litter started to open one eye on the 35th day and both eyes were completely opened on the 37th day. The greatest development in this marten during the first three weeks was in total length. Later on, the growth was confined to a filling out of various portions of the body. At three weeks of age the young marten crawled about in the den. When 45 days old it would run into the chute whenever the cover of the den was lifted. It ventured forth from the den into the pen for the first time to eat feed out of the same dish with its mother on the 56th day. At eight and one-half weeks of age it would habitually stand sticking its head through the door of the den to observe what was going on outside.

The tentative conclusions based upon the findings thus far were:

(1) Male and female martens live agreeably together during most seasons of the year; (2) they should be together at all times except during March, April, and May; (3) male martens will fight most ferociously whenever they come in contact; (4) martens normally breed in July and August - most frequently in the early part of August; and (5) the normal period of gestation may be eight months and not two or three months as commonly believed.

After a careful study of the tentative conclusions it was decided to separate the sexes the next season (July and August, 1921), after satisfactory matings had been observed, and keep them separate until May of the following year.

The young marten raised at the fur experiment station developed into an unusually fine specimen, growing to be slightly larger than its parents. Its fur was very dark brown and carried an exceptionally bright luster. The parents continued to thrive.

Conditions at the experiment station were not satisfactory for keeping the martens under close observation. Since no matings were observed during the summer of 1921, the female was allowed to run with the male from July 13, 1921, to April 1, 1922. Although no matings were seen during this period, the marten that produced the litter in 1921 gave birth to three female young on April 16, 1922.

The old female marten that had produced the two litters described was seen to accept service several times from July 28 to August 6, of that year. After this she fought off the attentions of the male. One of the young females born in April, 1922, was seen to copulate on August 4, 1922, and two others of the same litter were served two days later. The marten that came in heat on August 4 was served several times up to August 19 and again on September 3, though no matings were observed between August 19 and September 2.



During the summer of 1922 the males and females were kept separated at night and turned together during the day, because it was believed that this would increase the chances of observing matings. When the females came into heat, the males usually served them within an hour after admission, sometimes immediately after they were turned in in the morning. Such copulations oftentimes occurred in spite of the immediate presence of observers. All of the male martens used in these experiments were found to be polygamous.

During the oestral period the female frequently makes a clucking noise entirely different from that commonly made at other times. She squats, urinates frequently, and mounts the male when he is apparently passive. She sometimes switches her tail nervously, and wrestles with the male considerable, though squealing loudly when handled too roughly. If the female will not accept service readily, the male will chase her and struggle until service is accomplished.

The duration of the oestral period is from ten to thirteen days. The presence of the male annoys the female during the post-oestral period, as is noted frequently by the very antagonistic attitude she assumes toward him. Before long he desists.

The male and female martens were separated on September 10, 1922, and kept separate until July, 1923, in order to determine whether the gestation period were approximately eight months. In January, 1923, two of these four females died. One was the female that reared the two litters and the other was a young female born in the spring of 1922. Two females, which were about four months old when they bred, failed to produce any young in the spring of 1923. No evidences of pregnancy were noticeable in the two females that died about five months after they were seen to breed.

In connection with these experiments the question has arisen as to whether the fertilized ova in martens may lie in a somewhat dormant state for several months before noticeable embryonic development begins. Williams\*, in discussing the duration of pregnancy in wild animals, states: "Harms notes the peculiar fact that in the deer there is a period of 40 weeks between fertilization and the birth of the young, but this time does not represent the period of development of the fetus as we understand it in most animals. The ovum of the deer undergoes segmentation and then lies in the uterus for 4 months in an essentially dormant state. About December the distinctive embryonic development begins, and birth follows in May or June, about 5 months later.\*\*\*\* It is suggested that this delay in the development of the young is a provision by which it may be born at a favorable season of the year.\*\*\*\*"

Three females were seen to copulate in August, 1923. These were separated from the males in September, as was done the year previously. No litters were produced in the following spring (1924).

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\*Williams, Walter Long, Veterinary Obstetrics, p. 169, 1917.

There were only two females left at the fur experiment station in the summer of 1924. These, however, came in heat in August, but only one was seen to accept service. The two males were more than ten years of age and showed indications that their period of usefulness was about at an end. No young martens were born in the spring of 1925.

The remaining females bred again during August, 1925, but no young resulted, and one breeding was noted in the summer of 1926, without young being produced the following spring.

On April 6, 1927, a female marten, which was trapped in the wild during the latter part of December, 1926, gave birth to a litter of three young. This female only had access to a male for a few hours every other day during the last three weeks of February. It is not believed that this animal was bred on any of these occasions because it was observed that she would not tolerate the presence of the male. When he attempted to enter her pen she invariably drove him back to his own. It is believed that this female was bred in the wild sometime prior to the time of her being trapped.

On August 19, 1920, a prominent breeder of silver foxes, who had been keeping martens for seven years without having young produced, visited the fur experiment station at Keeseville, N. Y. The results he noted at the farm convinced him that male and female martens lived agreeably together during the summer months. On returning to his ranch he advised the keeper immediately to permit the practice, but as no matings were observed, it was concluded that the period of heat was over and the martens were put together too late. This fox rancher saw a pair of his martens mate in the latter part of July of the next year, and asserted that the male did not have access to the female after the latter part of August, 1921. A litter was born during April, 1922.

#### SUMMARY

All matings or signs of heat that have been observed in martens at the Government fur experiment station have occurred between July 28 and September 3, particularly about the middle of August. On no occasions were signs of heat or mating observed during the winter months.

All the females that produced young were with a male during the summer as well as the winter months.

In no instance did females produce young when they were with a male during the winter months only.

Thus far it has not been possible definitely to determine whether summer matings are normal or whether the period of gestation is 2 to 3 months or approximately 8 months. Of the five females that were separated from the male after the summer mating period, only one was a proved mother. When this animal was separated with a view of determining the length of the gestation period, she died, a few days before the middle of January, or approximately three months before the normal time of whelping.

